Impulses for a new awareness of life

EMG-controlled electrostimulation for learning motor movement sequences.

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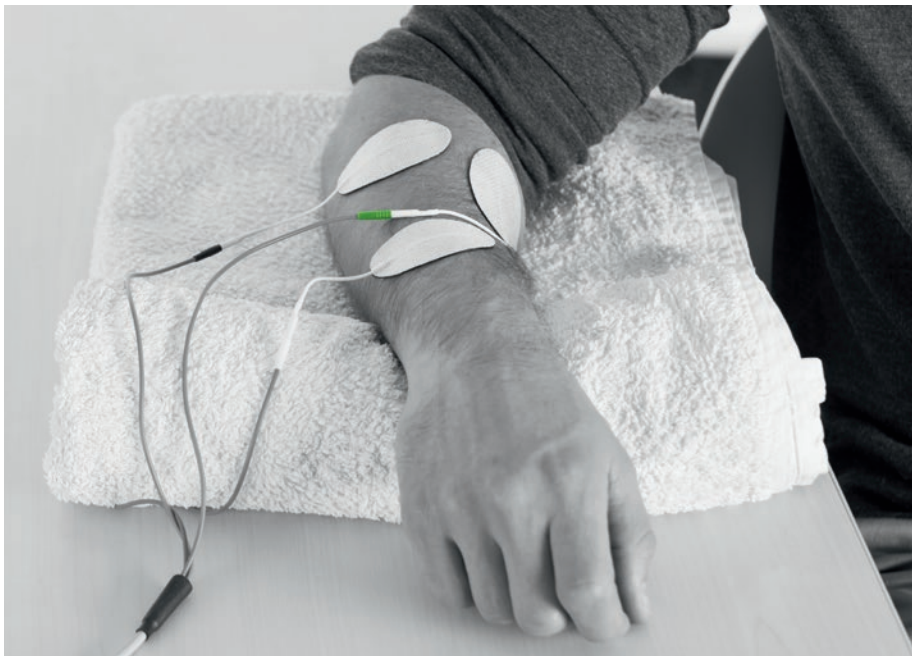
mentastim

mentastim

EMG-controlled electrostimulation with biofeedback

Starting movements for patients with pareses after a stroke, skull/brain trauma, brain operation and partial paraplegia.



Extend your therapy spectrum and close the gap between the rehab clinic, out-patient therapy and home therapy: help your paresis patients to actively promote their recovery!

Benefit from neuroplasticity – include patients actively

EMG-controlled electrotherapy using mentastim is the optimal complement to conventional therapies for patients wishing to make a significant contribution to their rehabilitation.

The therapy process takes advantage of the capability of the central nervous system to restructure itself where destroyed nerve tissue has led to the breakdown of motor functions. The neuroplasticity of the brain makes it possible to adapt to changed conditions and to relearn targeted control of movements.

mentastim has been developed for the treatment of pareses after damage to the central nervous system

Neurons in the healthy area of the brain can take over the functions of the destroyed tissue, although to do so they require "stimulation" in the truest sense of the word. The stimulation is derived from two sources: from the patient, who promotes this process cognitively by imagining movement of the paralysed extremities, and from the paralysed muscle, which is electrically stimulated by mentastim.

The "mental movement" increases the electrical potential of the muscle that is measured by mentastim as an electromyogram (EMG).The muscle is then electrically stimulated by the mentastim electrodes, thereby providing the brain with positive feedback as to the planned movement execution. In time, the brain relearns how to actuate the muscle again due to positive feedback being available again and the many repetitions.

mentastim can be used for:

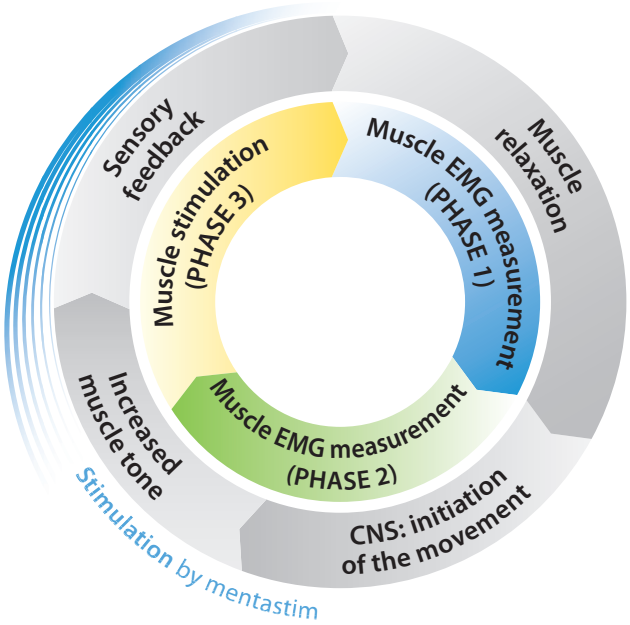
- Disease or injury to the central nervous system (such as stroke, skull/brain trauma, brain tumour operation, infantile brain damage)
- Injury to the spinal cord, such as incomplete paraplegia
- Spasms based on existing paresis

Aims of therapy:

- Regulation of muscle tone and reduction of spasms
- Reduction of ataxia
- Initiation and relearning of movement sequences
- Improvement of fine motor coordination
- Prevention of damage resulting from faulty posture

mentastim – therapy procedure

mentastim functions according to the principle of EMG-controlled electrostimulation. Two electrodes are affixed to the skin above the paralysed muscle. The resting EMG is then measured using a third electrode, the neutral electrode outside of the target muscle.



This is followed by a phase of imaging movement (cognitive training): the patient imagines a movement with the paralysed extremity. The mental performance of the patient during the movement imagination increases the electrical potential, the so-called EMG value, at the paralysed muscle group.

Where the EMG potential reaches an individually preset threshold value, mentastim triggers an electrical muscle stimulation. This is the positive feedback for the planned performing of the movement to the brain, and closes the control loop necessary for successful relearning.

mentastim – easy to use

- Easy visual and acoustic therapy management
- Automatic adaptation of the threshold value to the patient's daily performance capability
- Secure expert mode (individual program settings for patients)
- Data storage for therapy logs with export function

Therapy with mentastim promotes the reorganization of the brain to relearn motor movement patterns.

mentastim mobilises

For many patients who are deprived of their physical self-determination through a stroke, skull/brain trauma or brain operations, it is extremely important that they participate in therapy themselves, and that they are able to perform the therapy themselves. They receive immediate notification of success in therapy – this can be detected in the form of an electrical impulse from mentastim to the muscle. For the patient, this is a confirmation that he has successfully actuated a movement at the paretic extremity.

mentastim –
for rehab in the clinic, at the therapist and at home:

mentastim is extremely well suited for use in in-patient and out-patient rehabilitation, but can also be used at home by the patient where the device is set by you. The device is designed for domestic therapy, and is easy and intuitive to operate. After in-patient rehabilitation, mentastim enables the patient to continue seamlessly with therapy, as mentastim therapy then continues on an out-patient basis and at home.

For you as a therapist, EMG-controlled electrostimulation using mentastim provides an opportunity to extend your range of therapeutic services. Where the device is acquired for your clinic or practice, it can be used for different patients or lent out for use at home.

The patient learns to use the device in your practice. The therapy data is automatically stored. You have the option to read out the data and to adjust the parameters. Consequently, you retain control over the portion of therapy that occurs at the patient's home, as you adjust the therapy parameters to the results of therapy on a regular basis.

Scientific basis for EMG-controlled electrostimulation

Therapy with EMG-controlled electrostimulation can assist patients with brain damage as a result of a stroke, skull/brain trauma or brain surgery, to regain motor capabilities. The basis for this rehabilitation therapy is the capability of the brain to restructure and recruit neurons that are not affected by the damage (neuroplasticity) [1].

Therapy with mentastim requires motivation, frequent repetition and positive feedback, and therefore combines the treatment methods of biofeedback, repetition and response by means of therapeutic electrostimulation.

The clinical effectiveness of EMG-controlled muscle stimulation has been shown in studies and meta-analyses. These primarily investigated patients who had suffered strokes. The main criterion for effectiveness was an improvement in motor capabilities.

A meta-analysis with 86 hemiparetic patients was performed at the University of Florida in the USA [2]. Of these, 47 patients were treated using EMG-controlled electrostimulation. The other 39 patients acted as a control. All participants showed paralysis in the area of the upper extremities. Eighty-four percent of patients were in a chronic phase, and 16% in an acute or subacute phase. The mean effect size of EMG-controlled electrostimulation on the arm or hand function was 0.82 (standard deviation 0.95, confidence interval 0.10 – 1.55). This significant effect size suggests a positive influence of therapy on motor capabilities. The studies varied in terms of effect size however, as is evidenced by the size of the confidence interval.

In a systematic Cochrane review, 24 studies with stroke patients were evaluated. The studies were extremely heterogeneous in terms of the type of electrostimulation and the start of rehabilitation after the stroke. With the exception of a drawing test, the comparison of motor capabilities after electrostimulation or no rehabilitation therapy showed the advantage of electrotherapy. This also applied to a study that compared electrostimulation with a placebo. In studies that compared electrotherapy with other therapeutic procedures, the electrostimulation therapies were more convincing in terms of the improvement in motor limitations [3].

In a clinic for neurological and geriatric rehabilitation, a study was conducted on 12 patients who had suffered strokes a mean 46 months previously [4]. The patients used EMG-controlled electrostimulation by means of the predecessor model from mentastim for 6 months at home. In 8 patients, an improvement in voluntary motor function or a decrease of spasms was subsequently seen. No change was noted in 3 patients. One patient terminated his participation in the study as the pain he reported previously had intensified. The study showed that by using EMG-controlled muscle stimulation, an improvement in motor function can still be achieved even long after a stroke has occurred.

A study from 2012 [5] investigated the effect of mental training in combination with EMG-controlled electrostimulation on paralysed upper extremities. Seven patients whose strokes had already occurred a significant time ago were treated using this therapy. The 7 patients in the comparison group received functional electrotherapy. The study group showed significant improvement in motor function - a median of 7 points according to the Fugl-Meyer motor function scale [6]. No improvement was seen in the comparison group. The difference was significant.

[1] Kleim JA (2011): Neural plasticity and neurorehabilitation: teaching the new brain old tricks. J Commun Disord 44(5):521-8.Review.]

[2] Bolton DA, Cauraugh JH, Hausenblas HA (2004): Electromyogram-triggered neuromuscular stimulation and stroke motor recovery of arm/hand functions: a meta-analysis. J Neurol Sci 30; 223(2):121-7.

[3] Pomeroy VM, King L, Pollock A, Baily-Hallam A, Langhorne P (2006): Electrostimulation for promoting recovery of movement or functional ability after stroke. Cochrane Database Syst Rev 19;(2):1-68.

[4] Crisan R, Garner C (2001): Wirksamkeit der EMG-initiierten Muskelstimulation bei Patienten mit schon länger zurückliegendem Schlaganfall unter häuslicher Anwendung. Neurol Rehabil 7(5):228-232.

[5] Hong IK, Choi JB, Lee JH (2012): Cortical changes after mental imagery training combined with electromyography-triggered electrical stimulation in patients with chronic stroke. Stroke 43(9):2506-9.

[6] Crow JL, Harmeling-van der Wel BC (2008): Hierarchical properties of the motor function sections of the Fugl-Meyer assessment scale for people after stroke: a retrospective study. Phys Ther 12:1554-67.

Prescribability and availability of the device

mentastim is a prescribable therapy for in-patient, out-patient and home us. In the case of medical indication, the costs for therapy are generally assumed by the medical insurance company, and the device is made available on a monthly basis to the extent that the therapy is prescribed as a useful complement to treatment.

Where medical insurance does not provide reimbursement, the patient has an option to use mentastim therapy as a private health benefit.

As a therapist, you can obtain mentastim devices at an authorised medical device specialist dealer. Also provide the dealer with your contact details if you would like this information to be forwarded to patients in your area for whom mentastim has been prescribed. You can find information under www.mentastim.com

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TQ-Systems GmbH is certified by TÜV Süd as per DIN EN ISO 13485:2012/AC:2012 and Guideline 93/42/EWG (MDD) Appendix VI for Medical Devices, DIN EN ISO 9001:2008 (Quality management system) and DIN EN ISO 14001 (Environmental management)

Information for physiotherapists, ergotherapists and doctors active in rehabilitation.

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